ISSN 0097-4463

ANNALS of CARNEGIE MUSEUM

CARNEGIE MUSEUM OF NATURAL HISTORY

4400 FORBES AVENUE • PITTSBURGH, PENNSYLVANIA 15213

VOLUME 50 18 DECEMBER 1981 ARTICLE 21

DISTRIBUTION AND TAXONOMIC STATUS OF *BLARINA HYLOPHAGA* ELLIOT (INSECTIVORA: SORICIDAE)

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ABSTRACT

Systematic relationships of southern populations of short-tailed shrews (genus *Blarina*) are assessed on the basis of univariate and multivariate statistics. Populations are separated into two phena; southwestern short-tailed shrews are significantly larger morphometrically than southeastern forms. The two phena apparently represent distinct species. The name *Blarina hylophaga* is available for southwestern populations, and the name *Blarina carolinensis* is here restricted to short-tailed shrews in the southeastern United States.

INTRODUCTION

Short-tailed shrews of the genus *Blarina*, excepting those from the Dismal Swamp of Virginia and North Carolina, formerly were assigned to the species *B. brevicauda* (Hall and Kelson, 1959:52; Hall, 1981). The only subspecies of short-tailed shrew recognized on the southern

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Submitted 2 June 1981.

Great Plains was *B. b. carolinensis* until Elliot (1899) named *B. b. hylophaga* based on two specimens from Dougherty, Murray Co., Oklahoma. Blair (1939) described the latter subspecies as ". . . a slight local race, developed through partial isolation in the Arbuckle Mountains." Subsequently, Jones and Glass (1960) examined specimens of *Blarina brevicauda* from Oklahoma and found no appreciable differences between the two subspecies. They therefore assigned all short-tailed shrews from Oklahoma to the subspecies *B. b. carolinensis* and relegated *B. b. hylophaga* as a junior synonym of *B. b. carolinensis*. In the same paper, Jones and Glass noted a difference in size between specimens of *carolinensis* from Oklahoma and specimens from near the type locality of *carolinensis* in South Carolina; western shrews were described as appreciably larger than eastern shrews. This difference was attributed to clinal variation in size although the authors examined no specimens between South Carolina and Oklahoma.

Cockrum (1952), Jones and Findley (1954), and Jones (1964) all noted that the genus *Blarina* exhibits clinal variation in size, from north to south, with a large step in southern Nebraska. On the basis of these observations, Genoways and Choate (1972) examined specimens from Nebraska to ascertain whether that step represented a subspecific or specific boundary. The results of their study, plus karyotypic data obtained later (Genoways et al., 1977), suggested that the latter was the case and two species of *Blarina* exist on the Great Plains—*B. brevicauda* in the north, and *B. carolinensis* in the south. George et al. (1982) compared the karyotypes of populations presently assigned to *Blarina carolinensis* in the southern United States and concluded that they represent distinct eastern and western species. This study was undertaken to assess variation between those eastern and western populations and to ascertain the distribution and taxonomic status of the southwestern taxon, for which the name *B. hylophaga* is available.

Materials and Methods

A total of 380 specimens was examined from Alabama, Arkansas, Georgia, Kansas, Louisiana, Mississippi, Missouri, Oklahoma, South Carolina, Tennessee, and Texas. These specimens are deposited in the collections listed in the Acknowledgments.

Specimens were aged on the basis of toothwear and condition of pelage (Choate, 1972). For statistical analyses, all age and sex groups were pooled because no appreciable secondary sexual or age variation has been found in the genus (Guilday, 1957; Choate, 1972; Schmidly and Brown, 1979). Nine cranial and mandibular measurements (described by Choate, 1972) were recorded in mm from each specimen: occipitopremaxillary length (OPLEN); P^4–M^3 length (PMLEN); cranial breadth (CRNBR); breadth of zygomatic plate (ZYPBR); maxillary breadth (MAXBR); interorbital breadth (INOBR); mandibular length (LENMA); mandibular height (HEMAN); articular breadth (ARTBR). All measurements were taken with dial calipers accurate to 0.1 mm. Only specimens with complete data were used in statistical analyses.

Discriminant analysis was performed with a computer program from the Statistical

Package for the Social Sciences (Nie et al., 1975). Reference samples were from western Kansas (sample number 1, below) and the southeastern United States (sample 19, below). Because of the paucity of specimens from the Southeast and the need for a relatively large reference sample, all specimens available from Alabama, Georgia, Mississippi, South Carolina, and Tennessee were included in the southeastern reference sample. All specimens measured from Arkansas, southern Kansas, Louisiana, southern Missouri, Oklahoma, and Texas were evaluated with the discriminant equation generated from the reference samples, and the resulting scores were plotted to determine taxonomic affinities.

Standard statistics (mean, standard deviation, standard error, and coefficient of variation) were calculated for sample measurements using a computer program of the Statistical Analysis System, SAS (Helwig and Council, 1979). Nineteen samples (Fig. 1) were pooled on the basis of geographic locality and results of the discriminant analysis, as follows (sample sizes in parentheses): 1) Kansas—Ellis, Graham, Norton, Phillips, Rooks, Rush, Sheridan, and Trego counties (46 specimens); 2) Kansas—Greenwood County (21); 3) Oklahoma—Payne County (11); 4) Oklahoma—Osage County (17); 5) Arkansas—Benton, Fulton, Stone, and Washington counties, and Missouri—Camden, Greene, and Wright counties (13); 6) Arkansas—Craighead, Cross, Greene, and Mississippi counties (98); 7) Oklahoma—Cleveland County (5); 8) Oklahoma—Murray County (9); 9) Arkansas—Jefferson, Prairie, Pulaski, and Saline counties (11); 10) Arkansas—Howard, Little River, Polk, and Union counties (5); 11) Arkansas—Ashley and Drew counties (14); 12) Louisiana—near Blanchard, Caddo Parish (4); 13) Louisiana—near Greenwood, Caddo Parish (16); 14) Louisiana—Bienville, Grant, Lincoln, and Winn parishes (8); 15) Texas—Nacogdoches County (6); 16) Texas—Hardin, Newton, Tyler, and Walker counties (49); 17) Louisiana—Calcasieu, Evangeline, Sabine, Vernon, and West Baton Rouge parishes (8); 18) Texas—Aransas County (2); 19) Alabama—Cullman, Etowah, Hale, Russell, and Sumter counties, Georgia—Dodge, Earl, Grady, Liberty, and Thomas counties, Mississippi—Adams, Harrison, Marshall, Scott, and Tishomingo counties, South Carolina—Charleston and Georgetown counties, and Tennessee—Decatur, Madison, and Shelby counties (37).

Using SAS, a one-way analysis of variance (F test) and Duncan's multiple range test were used to test for significant differences among means and to identify maximal nonsignificant subsets. A multivariate analysis of variance (MANOVA) and canonical analysis were performed with SAS to assess the extent of morphometric divergence among samples.

RESULTS

Standard statistics, results of Duncan's multiple range test, and analysis of variance are shown in Table 1. For all characters, analysis of variance revealed highly significant differences among samples ($P < 0.0001$). Duncan's multiple range test showed significant differences between, on the one hand, samples from Kansas (1 and 2), Oklahoma (3, 4, 7, and 8), the Ozarks of Arkansas and Missouri (5), Greenwood, Caddo Parish, Louisiana (13), and Aransas County, Texas (18) and, on the other hand, samples from Arkansas (6, 9, 10, and 11), Louisiana (12, 14, and 17), eastern Texas (15 and 16), and east of the Mississippi River (19) for two of the nine measurements (OPLEN and CRNBR). For PMLEN, MAXBR, LENMA, and ARTBR, a similar relationship was found; however, there was some overlap between the two groups. Sample 15 did not differ significantly from sample 8 for LENMA, and

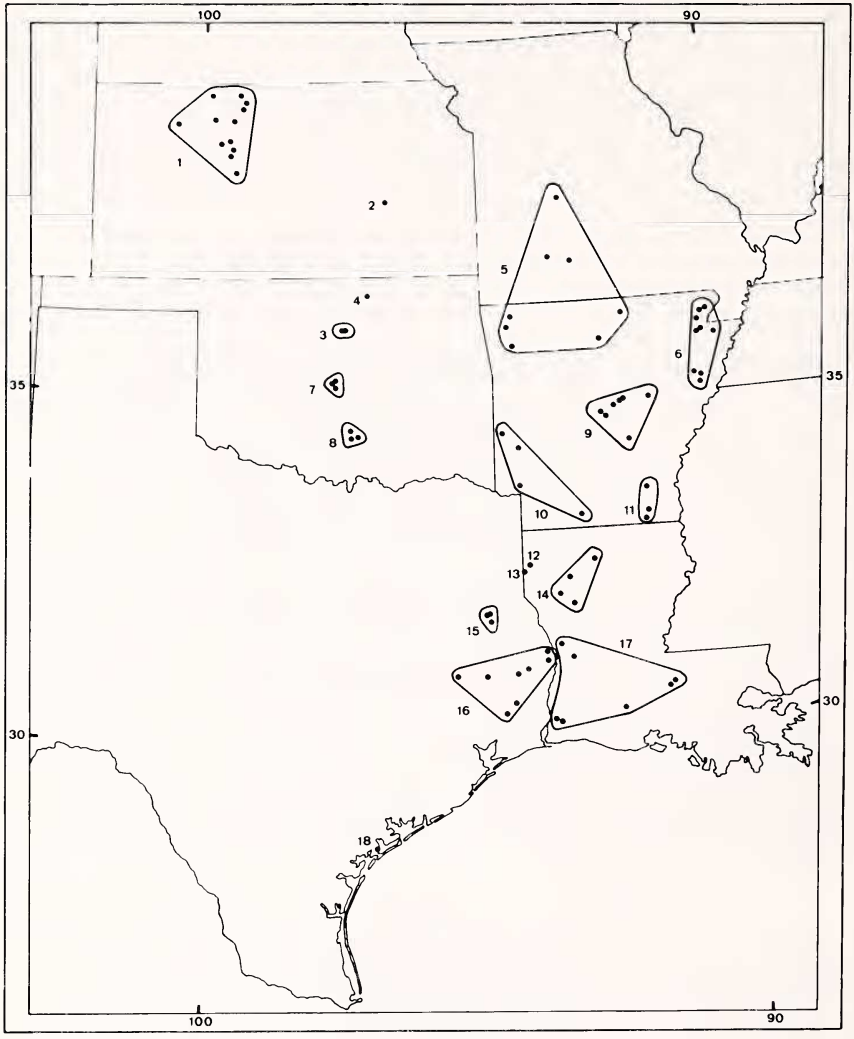

Fig. 1.—Geographic distribution of samples of *Blarina*. Numbers refer to samples described in text.

from 8, 13, and 18 for PMLEN. Sample 18 did not differ significantly from 15 and 6 for MAXBR. Samples 18, 13, and 8 did not differ significantly from 6, 9, 10, 11, 12, 14, 15, 16, 17, and 19 for ARTBR. For INOBR and HEMAN, sample 15 is placed with the former group described above, but for INOBR it did not differ significantly from sam-

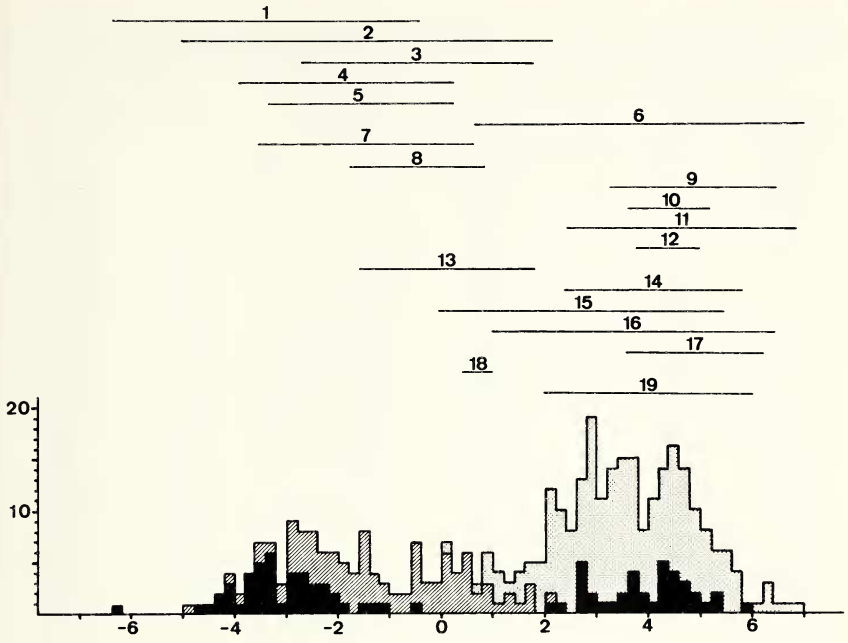

Fig. 2.—Histogram of linear discriminant scores for short-tailed shrews. Discriminant scores are indicated along the horizontal axis, and frequency of individuals is indicated along the vertical axis. Reference specimens are indicated by darkened areas, test specimens referred to the southwestern phenon (referred to as "*hylophaga*") are indicated by crosshatched areas, test specimens referred to the southeastern phenon (referred to as "*carolinensis*") are indicated by stippled areas. Horizontal lines above the histogram correspond to ranges of discriminant scores for samples described in text.

ple 6. For ZYPBR, the samples grouped in a different order, with a great deal of overlap among them; however, coefficients of variation for the character were high, thus reducing the probability of finding significant differences among samples.

Discriminant multipliers are given in Table 2, and discriminant scores for reference and test specimens are plotted in Fig. 2. The analysis clearly discriminated between eastern and western reference samples. Test specimens were discriminated as members of one or the other of these two phena, although scores of shrews from southern Oklahoma and northwestern Louisiana approached those of southeastern reference specimens. Likewise, scores of shrews from northeastern Arkansas approached those of the southeastern reference specimens and, in fact, overlapped with scores of specimens from

Table 1.—*Geographic variation in cranial characters of* Blarina. *Samples and measurements are explained in the text. Vertical lines alongside geographic samples indicate nonsignificant subsets. All F statistics were significant* ($P < 0.0001$).

Sample	N	Mean	Range	2 SE	CV
Occipitopremaxillary length (F = 120.92)					
1	46	20.89	19.9–21.9	0.13	2.13
2	21	20.66	19.7–21.6	0.19	2.16
4	17	20.61	19.8–21.2	0.18	1.77
5	13	20.61	20.0–21.3	0.27	2.36
7	5	20.24	19.7–21.0	0.46	2.56
3	11	20.14	19.5–20.8	0.26	2.11
18	2	19.95	19.9–20.0	0.10	0.35
8	9	19.80	19.4–20.4	0.21	1.58
13	16	19.62	19.1–20.5	0.17	1.75
15	6	19.25	18.8–19.8	0.35	2.22
6	98	18.94	17.7–19.6	0.07	1.88
19	37	18.60	17.6–19.3	0.12	1.98
16	49	18.57	17.9–19.4	0.11	2.06
12	4	18.55	18.5–18.6	0.06	0.31
14	8	18.51	18.0–19.0	0.24	1.81
10	5	18.44	18.1–18.7	0.25	1.51
9	11	18.44	18.1–19.1	0.19	1.67
11	14	18.33	17.7–19.1	0.21	2.12
17	8	18.28	17.8–18.6	0.20	1.57
P^4-M^3 length (F = 52.50)					
1	46	5.77	5.3–6.2	0.05	3.18
5	13	5.75	5.4–6.0	0.10	3.14
2	21	5.70	5.4–6.0	0.08	3.30
4	17	5.67	5.5–5.9	0.07	2.40
7	5	5.62	5.5–5.9	0.16	3.18
3	11	5.59	5.4–5.9	0.10	2.82
18	2	5.55	5.5–5.6	0.10	1.27
13	16	5.48	5.2–5.8	0.07	2.60
8	9	5.48	5.3–5.7	0.08	2.19
15	6	5.37	5.2–5.5	0.08	1.92
6	98	5.26	4.9–5.6	0.03	2.75
12	4	5.20	5.1–5.3	0.16	2.22
16	49	5.18	4.9–5.5	0.04	2.96
14	8	5.16	5.0–5.3	0.64	1.77
19	37	5.16	4.6–5.6	0.05	3.21
9	11	5.15	4.9–5.3	0.08	2.51
10	5	5.10	5.0–5.3	0.11	2.40
11	14	5.07	4.9–5.3	0.07	2.61
17	8	5.05	4.9–5.3	0.09	2.59

Table 1.—*Continued.*

Sample	N	Mean	Range	2 SE	CV
		Cranial breadth (F = 69.86)			
5	13	11.59	10.9–12.2	0.23	3.62
1	46	11.41	10.8–12.1	0.09	2.75
4	17	11.29	10.8–11.7	0.14	2.53
2	21	11.15	10.6–11.7	0.14	2.97
7	5	11.10	10.7–11.6	0.34	3.43
3	11	11.00	10.3–11.5	0.20	2.99
18	2	11.00	10.7–11.3	0.60	3.86
8	9	10.89	10.7–11.1	0.12	1.72
13	16	10.70	10.2–11.3	0.16	2.96
15	6	10.70	10.2–11.3	0.16	2.96
6	98	10.34	9.6–11.0	0.05	2.62
16	49	10.22	9.6–10.6	0.69	2.36
17	8	10.21	10.0–10.5	0.12	1.77
19	37	10.17	9.7–10.7	0.08	2.29
10	5	10.12	9.8–10.3	0.18	2.03
9	11	10.06	9.6–10.4	0.16	2.68
14	8	10.05	9.8–10.4	0.15	2.13
11	14	10.00	9.6–10.6	0.13	2.48
12	4	9.95	9.9–10.0	0.06	0.58
		Breadth of zygomatic plate (F = 9.80)			
5	13	2.32	2.0–2.5	0.08	6.32
1	46	2.25	2.0–2.6	0.04	5.84
8	9	2.20	2.0–2.4	0.11	7.19
2	21	2.18	1.8–2.5	0.07	6.90
18	2	2.15	2.0–2.3	0.30	9.82
4	17	2.12	1.9–2.3	0.06	5.40
19	37	2.11	1.7–2.4	0.06	8.24
13	16	2.11	2.0–2.3	0.06	5.87
7	5	2.10	1.9–2.3	0.14	7.53
3	11	2.09	1.8–2.4	0.10	8.13
6	98	2.04	1.7–2.3	0.03	6.92
15	6	2.02	1.9–2.2	0.10	5.80
14	8	1.99	1.7–2.1	0.10	6.82
16	49	1.98	1.6–2.2	0.04	7.62
10	5	1.96	1.7–2.1	0.15	8.54
9	11	1.96	1.5–2.2	0.14	11.75
12	4	1.95	1.9–2.0	0.06	2.96
11	14	1.94	1.8–2.2	0.08	7.48
17	8	1.94	1.7–2.2	0.11	8.25

Table 1.—*Continued.*

Sample	N	Mean	Range	2 SE	CV
		Maxillary breadth (F = 85.23)			
1	46	7.58	7.1–8.0	0.06	2.57
4	17	7.42	7.2–7.6	0.06	1.55
5	13	7.38	7.0–7.7	0.14	3.36
2	21	7.30	6.6–7.7	0.11	3.53
7	5	7.28	7.0–7.8	0.28	4.28
3	11	7.19	6.9–7.6	0.13	3.02
13	16	7.08	6.7–7.3	0.09	2.61
8	9	7.07	6.9–7.4	0.11	2.24
18	2	6.95	6.8–7.1	0.30	3.05
15	6	6.75	6.2–7.1	0.16	4.66
6	98	6.70	6.1–7.0	0.04	2.62
19	37	6.58	6.3–7.7	0.06	2.92
14	8	6.58	6.3–6.9	0.15	3.12
16	49	6.53	6.2–7.0	0.05	2.51
11	14	6.51	6.1–6.8	0.12	3.49
9	11	6.49	6.1–7.0	0.14	3.61
17	8	6.49	6.3–6.7	0.10	2.25
10	5	6.46	6.3–6.7	0.14	2.35
12	4	6.45	6.4–6.5	0.06	0.90
		Interorbital breadth (F = 39.55)			
1	46	5.58	5.2–5.9	0.05	2.97
4	17	5.56	5.4–5.8	0.05	2.00
5	13	5.53	5.2–5.9	0.14	4.51
2	21	5.50	5.4–5.7	0.04	1.67
7	5	5.50	5.4–5.7	0.11	2.23
3	11	5.40	5.1–5.9	0.13	4.14
8	9	5.39	5.3–5.6	0.07	1.96
18	2	5.35	5.1–5.6	0.50	6.61
13	16	5.31	5.0–5.5	0.08	2.99
15	6	5.27	5.1–5.5	0.13	3.10
6	98	5.12	4.5–5.5	0.03	3.24
19	37	5.06	4.8–5.5	0.05	3.27
16	49	5.06	4.8–5.3	0.03	2.42
14	8	5.05	4.7–5.3	0.15	4.23
11	14	5.04	4.8–5.3	0.07	2.55
17	8	5.02	4.9–5.3	0.10	2.96
10	5	5.02	4.8–5.2	0.13	2.95
12	4	4.95	4.9–5.0	0.06	1.17
9	11	4.92	4.7–5.1	0.08	2.70

Table 1.—*Continued.*

Sample	N	Mean	Range	2 SE	CV
		Mandibular length (F = 88.42)			
1	46	11.92	11.4–12.6	0.09	2.59
5	13	11.79	11.2–12.6	0.25	3.89
2	21	11.78	11.2–12.3	0.13	2.47
4	17	11.61	11.1–12.2	0.13	2.31
18	2	11.50	11.5	0	0
3	11	11.41	11.0–12.0	0.18	2.58
7	5	11.36	11.0–11.8	0.26	2.54
13	16	11.16	10.5–11.6	0.14	2.56
8	9	11.14	10.7–11.4	0.13	1.80
15	6	10.88	10.7–11.1	0.15	1.69
6	98	10.73	10.8–11.3	0.04	1.91
12	4	10.72	10.7–10.8	0.05	0.47
19	37	10.61	10.1–11.2	0.08	2.27
10	5	10.56	10.1–10.8	0.27	2.89
9	11	10.48	10.2–11.0	0.16	2.52
17	8	10.46	10.2–10.7	0.12	1.61
16	49	10.46	9.9–11.1	0.08	2.73
11	14	10.40	9.8–10.8	0.14	2.59
14	8	10.35	10.0–10.8	0.19	2.58
		Mandibular height (F = 101.39)			
1	46	6.30	5.8–7.3	0.07	3.53
5	13	6.28	5.9–6.7	0.16	4.56
2	21	6.17	5.7–6.7	0.12	4.53
7	5	6.06	5.9–6.4	0.17	3.22
4	17	6.05	5.9–6.3	0.06	2.12
3	11	5.93	5.5–6.3	0.14	4.00
18	2	5.85	5.6–6.1	0.50	6.04
8	9	5.81	5.6–6.1	0.10	2.64
13	16	5.78	5.5–6.1	0.09	3.17
15	6	5.55	5.3–5.7	0.11	2.48
6	98	5.39	4.9–5.8	0.03	2.82
19	37	5.33	5.0–5.6	0.06	3.21
12	4	5.32	5.1–5.5	0.17	1.17
14	8	5.28	5.1–5.6	0.12	3.16
16	49	5.26	4.9–5.7	0.05	3.20
11	14	5.21	5.0–5.6	0.09	3.32
17	8	5.20	5.0–5.3	0.08	2.06
9	11	5.17	5.0–5.4	0.07	2.13
10	5	5.14	4.9–5.3	0.16	3.53

Table 1.—*Continued.*

Sample	N	Mean	Range	2 SE	CV
		Articular breadth (F = 51.69)			
5	13	2.28	2.0–2.5	0.08	6.50
1	46	2.27	2.1–2.5	0.03	4.88
2	21	2.27	2.0–2.5	0.05	5.81
4	17	2.22	2.0–2.4	0.05	4.91
7	4	2.22	2.1–2.4	0.15	7.40
3	11	2.11	2.0–2.3	0.06	4.95
13	16	2.06	1.9–2.2	0.05	4.71
18	2	2.05	2.0–2.1	0.10	3.45
8	9	2.04	2.0–2.1	0.04	2.58
15	6	1.95	1.9–2.0	0.04	2.81
19	37	1.93	1.8–2.3	0.04	5.71
6	98	1.93	1.8–2.1	0.02	3.99
12	4	1.92	1.9–2.0	0.05	2.60
17	8	1.91	1.8–2.0	0.05	3.35
9	11	1.91	1.8–2.1	0.06	5.47
16	49	1.91	1.7–2.0	0.02	3.98
11	14	1.90	1.8–2.0	0.05	4.62
14	8	1.89	1.8–2.0	0.07	5.25
10	5	1.86	1.8–1.9	0.05	2.94

Oklahoma; however, scores of geographically adjacent southeastern and southwestern samples were discriminated clearly.

Four routines of MANOVA were employed to test the hypothesis that there is no significant morphometric difference among samples. The results of all four tests—Hotelling-Lawley's Trace (F = 18.05); Pillai's Trace (F = 4.43); Wilk's Criterion (F = 7.77); and Roy's Maximum Root Criterion (F = 149.57)—were significant at $P < 0.0001$. The variance-covariance matrix gave nine canonical variates among the nine characters for all 19 samples. The first canonical variate expressed 89.56% of the phenetic variation; the second, 3.00; and the third, 2.29. Two-dimensional plots of the first two canonical variates (showing the mean and one standard deviation on each side of the mean for each sample) are illustrated in Fig. 3. The samples are arranged into two groups—samples 1–5, 7, 8, 13, and 18 in the upper left of the figure, and samples 6, 9–12, 14–17, and 19 in the lower right.

Discussion

Univariate and multivariate analyses of southern short-tailed shrews indicate that southwestern and southeastern populations constitute distinct phena. Reference samples of these two phena were separated by discriminant analysis. Overlap between discriminant scores of a

Table 2.—*Discriminant multipliers resulting from a discriminant function analysis comparing* Blarina *from western Kansas (sample 1) with* Blarina *from Alabama, Georgia, Mississippi, South Carolina, and Tennessee (sample 8). Measurements are explained in text.*

Measurement	Discriminant multiplier
OPLEN	−2.297952
PMLEN	0.7744092
CRNBR	0.2387917
ZYPBR	0.1793111
MAXBR	−3.685247
INOBR	1.080935
LENMA	0.9018796
HEMAN	−1.026482
ARTBR	1.072587
Constant	52.46786

few specimens from northeastern Arkansas and northeastern Texas and those of specimens from southern Oklahoma and northwestern Louisiana reflects geographic variation within both southwestern and southeastern plena of *Blarina*. Univariate statistics and the canonical analysis revealed a clinal decrease in size from Kansas to Oklahoma and Louisiana in the larger, southwestern phenon, and from northeastern Arkansas to Louisiana and from northeastern Texas to southeastern Texas in the smaller, southeastern phenon. The smallest southwestern specimens from Oklahoma and northwestern Louisiana thus overlap with the largest southeastern specimens from Arkansas and Texas when analyzed with discriminant functions. With one exception (discussed below), this overlap is between specimens from noncontiguous populations and apparently is not indicative of mensural intergradation.

Karyotypes from northern Florida, northern Louisiana, South Carolina, western Tennessee, and eastern Texas (George et al., 1982) exhibit a fundamental number of 44 and diploid numbers ranging from 37 to 46 (probably the result of Robertsonian events). Divergence between these karyotypes and those (FN = 62, 61, or 60; 2N = 52) from Oklahoma and Kansas therefore is appreciable, and the probability that the two taxa intergrade is low. Morphometric data from this study support this conclusion and indicate that southeastern and southwestern phena of *Blarina* almost certainly represent two distinct species. The name *Blarina carolinensis* should be restricted to populations of short-tailed shrews in the southeastern United States, whereas the name *Blarina hylophaga* is available for populations of short-tailed shrews in the southwestern region of the range of the genus.

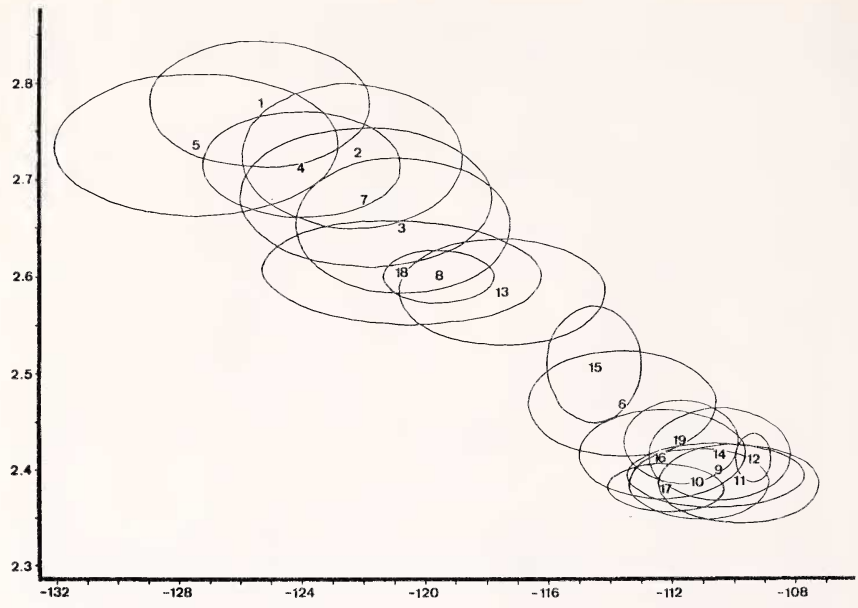

Fig. 3.—Plot of the mean and one standard deviation of the first two canonical variates for 19 samples of *Blarina*. Numbers refer to samples described in text.

Blarina hylophaga hylophaga Elliot

Blarina brevicauda hulophaga [sic] Elliot, Field Columbian Mus., Zool. Ser., 1:287, 1899; Blair, Amer. Midland Nat., 22:99, 1939; Hall and Kelson, The mammals of North America, 1:54, 1959.

Blarina brevicauda hylophaga Elliot, Field Columbian Mus., Zool. Ser., 6:461, 1905 (correction of previous error in spelling or transliteration).

Blarina brevicauda carolinensis: Blair, Amer. Midland Nat., 22:99, 1939; Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 7:43, 1952; Hall and Kelson, The mammals of North America, 1:53, 1959; Jones and Glass, Southwestern Nat., 5:138, 1960; Jones, Univ. Kansas Publ., Mus. Nat. Hist., 16:69, 1964; Bowles, Spec. Publ. Mus., Texas Tech Univ., 9:37, 1975; Hall, The mammals of North America, 1:54, 1981.

Blarina carolinensis carolinensis: Genoways and Choate, Syst. Zool., 21:114, 1972; Ramsey, unpubl. M.S. thesis, Arkansas State University, p. 40, 1977; Schmidly and Brown, Southwestern Nat., 24:45, 1979; Selander, A guide to Arkansas mammals, p. 44, 1979.

Holotype.—Male, adult; skin and skull; FMNH 6770, Field Museum of Natural History; from Dougherty, Murray Co., Oklahoma; collected 4 April 1899 by Mr. Thaddeus Surber, original number 154. (In Elliot's original description, it is unclear which of the two specimens, a male and a female, he had at hand was to be the holotype; however, in a

subsequent publication [Elliot, 1907], the male is clearly indicated as the "type" and the female as the "paratype.")

Diagnosis.—Size medium for the genus in both external and cranial measurements; 2N = 52; FN = 62, 61, or 60.

Comparisons.—*Blarina h. hylophaga* can be distinguished from *B. brevicauda* by its much smaller size, shorter winter pelage, and by its karyotype (*B. brevicauda*: 2N = 50, 49, or 48; FN = 48). *B. hylophaga* can be distinguished from *B. carolinensis* by its significantly larger size (both cranial and external), and by its karyotype (*B. carolinensis*: 2N = 46, 39, 38, or 37; FN = 44 or 45).

Range.—From southern Nebraska (Jones, 1964; Genoways and Choate, 1972), southwestern Iowa (Bowles, 1975), extending into east-central Colorado along the Republican River (Armstrong, 1972), through Kansas, Missouri (exclusive of the northeastern and extreme southeastern corners), northwestern Arkansas (Hall, 1981), central and eastern Oklahoma (exclusive of the southeastern corner), and extending into northeastern Louisiana. Specimens from northeastern Texas reported by Schmidly and Brown (1979) as *B. c. carolinensis* are considered to belong to that species and not *B. hylophaga*.

Remarks.—Specimens with complete measurements from southeastern Missouri were unavailable, and we were unable to locate the contact zone between *Blarina carolinensis* and *Blarina hylophaga* in that state. A few specimens with incomplete measurements were examined, and some suggestions about the distributional relationship between the two species can be made based on these. Two specimens from St. Louis Co., Missouri, apparently represent *B. carolinensis*. Whether these specimens represent a relict population of *B. carolinensis* isolated from the range of that species by the range of *B. hylophaga*, or whether the two species are sympatric on the Mississippi floodplain in eastern Missouri, cannot be determined until more extensive collecting is done in that region. Merriam (1895) assigned a specimen from Kimmswick, Jefferson Co., Missouri, which he regarded as an intergrade between large shrews known as *B. brevicauda brevicauda* and small shrews he referred to as *B. b. carolinensis*, to the taxon *B. b. brevicauda*. That specimen clearly pertains to *B. hylophaga*, and thus would have seemed almost intermediate in size between the much larger *brevicauda* and smaller *carolinensis*.

We were also unable to obtain specimens from southeastern Oklahoma, with the exception of one shrew from McCurtain County. This specimen had incomplete measurements, but those that it had (ZYPBR = 1.6; MAXBR = 6.6; INOBR = 5.2; LENMA = 10.4; HEMAN = 5.5; ARTBR = 1.8) indicate that it pertains to *Blarina carolinensis*, rather than *B. hylophaga*. How far *B. carolinensis* extends its range into Oklahoma cannot be determined, as the nearest speci-

mens collected (Atoka County to the west, Pittsburg County to the north) pertain to *B. hylophaga*.

Sample 13, from the vicinity of Greenwood, Caddo Parish, Louisiana, grouped with the shrews from Kansas and Oklahoma in all tests performed, although the sample generally was the smallest in size of the species; this conformed with the north-south clinal decrease in size described above. The sample was distinct from a sample from Blanchard, Caddo Parish, Louisiana (only 10 mi. northeast of Greenwood), which grouped with the other samples from Louisiana, Arkansas, and eastern Texas. As the sample from Greenwood, Louisiana, is on the opposite side of the Red River from the samples with which it is grouped, it might represent a relict population of *Blarina hylophaga*. An alternative explanation of this distribution is that *B. hylophaga* has extended its range across the Red River, but not south of the Sabine River. The range of *B. carolinensis* extends from Louisiana across the Red and Sabine rivers into eastern Texas. Thus, the area between the Red and Sabine rivers could have acted as a corridor whereby *B. hylophaga* has moved southward and eastward and come into contact with *B. carolinensis* in Caddo Parish, Louisiana. This cannot be determined until more specimens are collected in southern Oklahoma, northeastern Texas, northwestern Louisiana, and southwestern Arkansas.

Schmidly and Brown (1979) found shrews from northeastern Texas to be significantly larger than shrews from southeastern Texas, and thus assigned the former group to the same taxon as shrews from Kansas and Oklahoma. The results of this study, however, clearly show that animals from northeastern Texas group much closer to shrews from southeastern Texas and Louisiana than to those from Oklahoma and Kansas, and thus should be included within *Blarina carolinensis*, rather than *B. hylophaga*. Specimens from northeastern Texas are larger than those to the south and the east (excluding the sample from Greenwood, Louisiana); this variation probably is clinal, but this cannot be concluded with any certainty until more animals are obtained from those areas.

In Elliot's (1899) original description of *B. b. hylophaga*, the new name was misprinted or erroneously transliterated as *hulophaga*. Article 32(a) of the International Code of Zoological Nomenclature . . . states that the original spelling of a name may be corrected if "there is in the original publication clear evidence of an inadvertent error, such as a lapsus calami, or a copyist's or printer's error . . . ." The new name, "*hulophaga,*" was used only once in the original description, and was said (p. 288) to be a transliteration of "feeding in the woods." The correct transliteration should have been *hylophaga*. This

error was recognized by Elliot (1905), who corrected the spelling to *hylophaga,* but his correction was overlooked by subsequent authors (for example, Bole and Moulthrop, 1942; Miller and Kellogg, 1955; Hall and Kelson, 1959). Elliot's correction constituted a "justified emendation" of an "incorrect original spelling," and the name *hulophaga* thus has no status in nomenclature (see articles 32 and 33 of the International Code of Zoological Nomenclature . . .) .

Specimens examined.—ARKANSAS. *Benton Co.:* Hickory Creek, 6½ mi. NE Springdale, 1 (UA). *Fulton Co.:* T.20N, R.5W, Sec. 16, 1 (ASUZC). *Madison Co.:* 4 mi. N Fredericktown on E Hwy., 1 (ASUZC); 5½ mi. SW Fredericktown on Hwy. 80, 1 (ASUZC). *Marion Co.:* 13.9 mi. N Summit, 1 (ASUZC). *Stone Co.:* T.15N, R.11W, Sec. 5, 1 (ASUZC); Fiftysix (T.15N, R.12W, NW ¼ Sec. 12), 1 (ASUZC); 5 mi. S Fiftysix, 1 (ASUZC). *Washington Co.:* Fayetteville, 2 (UA); Winslow, 1 (UA); 2 mi. S Winslow, 1 (UA).

KANSAS. *Allen Co.:* no particular locality, 1 (KU); Moran, 3 (KU). *Anderson Co.:* 7 mi. S Garnett, 1 (KU); 1 mi. N Welda, 1 (KU). *Atchison Co.:* 1.8 mi. N Atchison, 1 (KU); 1½ mi. S Muscotah, 7 (KU). *Bourbon Co.:* 10 mi. S, 8 mi. W Fort Scott P.O., 2 (PSK); 6 mi. SW Uniontown, 1 (PSK). *Brown Co.:* Brown County Lake, 1 (MHP); 7 mi. N, ½ mi. E Hiawatha, 1 (KU); 3 mi. N Hiawatha, 1 (KU); 1 mi. S, 7 mi. E Hiawatha, 1 (MHP); 5 mi. S Hiawatha, 1 (KU); 1 mi. N Horton, 1 (KU). *Butler Co.:* 2 mi. N, 3/10 mi. W El Dorado, 1 (MHP). *Chase Co.:* 9 mi. E Lincolnville, 1 (KU); ¼ mi. N Matfield Green, 1 (KU). *Chautauqua Co.:* 1 mi. W Wauneta, 1 (KU). *Cherokee Co.:* no particular locality, 1 (KU); 3 mi. N Columbus, 2 mi. W Jct. 7 and 96, 1 (PSK); 1½ mi. S. Galena, 1 (KU); 1 mi. N Tri-State Monument, 1 (KU). *Cheyenne Co.:* 15 mi. N, 11½ mi. W St. Francis, 2 (KU); 1 mi. W St. Francis, 2 (KU). *Cloud Co.:* 3 mi. N, 2 mi. W Clyde, 1 (MHP); 4 mi. E Glasco, 1 (KU). *Coffey Co.:* Burlington, 1 (USNM); 2½ mi. S Burlington, 1 (KU). *Cowley Co.:* 6 mi. N, 12 mi. E Arkansas City, 1 (KU); 8.1 mi. E Arkansas City, 2 (KU); 3 mi. SE Arkansas City, 5 (KU); 2 mi. N, 3 mi. E Cameron City, 1 (MHP); 2 mi. S, ½ mi. W Udall, 1 (KU). *Crawford Co.:* no particular locality, 8 (PSK); 2 mi. N, 2 mi. E Arma, 1 (PSK); 1¼ mi. E Crawford County State Lake, 1 (PSK); Frontenac, 1 (PSK); Pittsburg, 5 (4 PSK, 1 UWSP); 2½ mi. E Pittsburg, 1 (PSK); 2 mi. S, 3 mi. E Pittsburg, 1 (PSK); 2½ mi. SW Pittsburg, 1 (PSK); 5 mi. S, 1 mi. W Pittsburg, 1 (PSK). *Dickinson Co.:* ½ mi. S Chapman, 1 (MHP); 2 mi. W Herington, 6 (MHP). *Doniphan Co.:* Geary, 1 (KU); ½ mi. N, ½ mi. W Severance, 1 (KU). *Douglas Co.:* no particular locality, 18 (KU); 1¼ mi. N Baldwin City, 1 (KU); 0.5 mi. S, 5.2 mi. W Clinton, 1 (KU); ½ mi. W Eudora, 2 (KU); 7 mi. NNE Lawrence, 2 (KU); 6 mi. NNE Lawrence, 1 (KU); 5 mi. N Lawrence, 2 (KU); 4.8 mi. N, 0.7 mi. E Lawrence, 1 (KU); 2.2 mi. N, 0.8 mi. E Lawrence, 2 (KU); 2 mi. N Lawrence, 1 (KU); 2 mi. N, 2 mi. E Lawrence, 2 (KU); 1½ mi. N, 1 1/5 mi. E Lawrence, 12 (KU); 1½ mi. N, 1¾ mi. E Lawrence, 7 (3 KU, 4 MHP); 1 mi. N, 4 mi. W Lawrence, 1 (KU); ½ mi. N, 1 mi. E Lawrence, 1 (KU); 2½ mi. W Lawrence, 1 (KU); 1 mi. W Lawrence, 4 (KU); Lawrence, 25 (3 AMNH, 20 KU, 2 USNM); 0.8 mi. S, 2.5 mi. W Lawrence, 1 (KU); 3.9 mi. S, 2.6 mi. E Lawrence, 1 (KU); 5¾ mi. S, ¾ mi. W Lawrence, 1 (KU); 7 mi. SW Lawrence, 4 (KU); 7½ mi. SW Lawrence, 5 (KU); ½ mi. S, ½ mi. E Pleasant Grove, 1 (KU); Rock Creek, 1 (KU); 1 mi. S, 1¼ mi. W Vinland, 1 (KU). *Ellis Co.:* 1 mi. S, 6½ mi. W Antonino, 19 (MHP); Ellis, 1 (MHP); 16 mi. N, 1 mi. W Hays, 3 (MHP); 9 mi. N, 4 mi. W Hays (T.12S, R.19W, NE ¼ Sec. 14), 2 (MHP); 8½ mi. N, 4 mi. W Hays (T.12S, R.19W, SE ¼ Sec. 14), 1 (MHP); 5 mi. N, 3.4 mi. W Hays, 1 (MHP); 4 mi. N, ¼ mi. W Hays, 1 (MHP); 3½ mi. W Hays, 1 (KU); Hays, 2 (1 MHP, 1 USNM); ¾ mi. S, 3½ mi. W Hays, 1 (KU); 1 mi. S, 6 mi. W Hays, 1 (MHP); 1 mi. S, 2 mi. W Hays, 1 (MHP);

1½ mi. W Hays (T.14S, R.18W, NE ¼ Sec. 7), 1 (MHP); 2½ mi. SW Hays, 1 (MHP). *Geary Co.:* 5 mi. S Grandview Plaza, 1 (MHP). *Graham Co.:* Antelope Lake, 1 mi. N, 14 mi. W Hill City, 2 (MHP); 2 mi. N, 2 mi. W Morland, 1 (MHP). *Greenwood Co.:* Hamilton, 34 (3 AMNH, 2 MMNH, 2 CM, 22 KU, 5 UMMZ); ½ mi. E Hamilton, 2 (KU); ¼ mi. S Hamilton, 2 (KU); ¼ mi. SE Hamilton, 1 (KU); ½ mi. SW Hamilton, 1 (AMNH); ½ mi. S Hamilton, 5 (KU); ½ mi. SE Hamilton, 2 (KU); 3.4 mi. S Hamilton, 1 (KU); 1 mi. S Hamilton, 2 (KU); 1½ mi. S Hamilton, 5 (KU); 8½ mi. SW Toronto, 1 (KU). *Harper Co.:* 1½ mi. S, 6 mi. W Anthony, 1 (MHP). *Harvey Co.:* ½ mi. N, 1 mi. E Halstead, 1 (KU); Newton, 1 (KU). *Jackson Co.:* ½ mi. N Holton, 1 (KU); Holton, 2 (1 AMNH, 1 KU); 5½ mi. E Holton, 2 (KU). *Jefferson Co.:* 5 mi. N, 2 mi. E Lawrence (*in* Douglas Co.), 1(KU); 4 mi. N, 2 mi. E Lawrence (*in* Douglas Co.), 1 (KU). *Jewell Co.:* 2 mi. N Lovewell (T.2S, R.6W, Sec. 10), 3 (MHP); 2 mi. N, 1 mi. E Lovewell (T.2S, R.6W, Sec. 11), 1 (MHP); 2 mi. N, 2 mi. E Lovewell (T.2S, R.6W, Sec. 12), 5 (MHP); 1 mi. N Lovewell (T.2S, R.6W, Sec. 15), 2 (MHP); 1 mi. S, 1 mi. W Lovewell (T.2S, R.6W, Sec. 28), 4 (MHP); 1 mi. S, 1 mi. E Lovewell (T.2S, R.6W, Sec. 26), 1 (MHP); 2 mi. S, 2 mi. W Lovewell (T.2S, R.6W, Sec. 32), 1 (MHP); 2 mi. S, 1 mi. W Lovewell (T.2S, R.6W, Sec. 33), 3 (MHP); 2 mi. S, 2 mi. E Lovewell (T.2S, R.6W, Sec. 16), 1 (MHP); 3 mi. N, 3 mi. W Mankato (T.2S, R.7W, Sec. 31), 1 (MHP); 3 mi. N, 1 mi. W Mankato (T.2S, R.7W, Sec. 33), 1 (MHP); 4 mi. N, ½ mi. W Montrose (T.2S, R.7W, Sec. 34), 3 (MHP); 2½ mi. S, 1½ mi. W North Branch (T.1S, R.10W, Sec. 25), 1 (MHP); 4 mi. N, 1 mi. E Webber (T.1S, R.6W, Sec. 5), 3 (MHP); 4 mi. N, 3 mi. E Webber (T.1S, R.6W, Sec. 3), 1 (MHP); 3 mi. N, 5 mi. E Webber (T.1S, R.6W, Sec. 12), 1 (MHP); 2 mi. N, 4 mi. W Webber (T.1S, R.7W, Sec. 16), 4 (MHP); 2 mi. N, 2 mi. E Webber (T.1S, R.6W, Sec. 16), 2 (MHP); 2 mi. N, 5 mi. E Webber (T.1S, R.6W, Sec. 13), 1 (MHP); 1 mi. N, 6 mi. W Webber (T.1S, R.7W, Sec. 19), 3 (MHP); 1 mi. N, 2 mi. W Webber (T.1S, R.7W, Sec. 23), 2 (MHP); 2 mi. E Webber (T1S, R.6W, Sec. 28), 1 (MHP); 4 mi. E Webber (T.1S, R.6W, Sec. 26), 1 (MHP); 1 mi. S, 5 mi. W Webber (T.1S, R.7W, Sec. 32), 3 (MHP); 1 mi. S, 2 mi. W Webber (T.1S, R.7W, Sec. 35), 3 (MHP); 1 mi. S, 1 mi. W Webber (T.1S, R7W, Sec. 36), 3 (MHP); 2 mi. S, 5 mi. W Webber (T.2S, R.7W, Sec. 5), 1 (MHP); 2 mi. S, 4 mi. W Webber (T.2S, R.7W, Sec. 4), 1 (MHP); 2 mi. S, 2 mi. E Webber (T.2S, R.6W, Sec. 4), 23 (MHP); 2 mi. S, 4 mi. E Webber (T.2S, R.6W, Sec. 2), 5 (MHP); 3 mi. S, 5 mi. W Webber (T.2S, R.7W, Sec. 8), 1 (MHP); 3 mi. S, 3 mi. W Webber (T.2S, R.7W, Sec. 10), 1 (MHP); 3 mi. S Webber (T.2S, R.6W, Sec. 7), 6 (MHP); 3 mi. S, 1 mi. E Webber (T.2S, R.6W, Sec. 8), 3 (MHP). *Kiowa Co.:* 6 mi. S, 2 mi. E Haviland, 9 (MHP). *Labette Co.:* Oswego, 1 (PSK); 2 mi. SW Parsons, 1 (PSK); 3 mi. S, 2 mi. E Parsons, 1 (PSK). *Leavenworth Co.:* no particular locality, 1 (KU); 1 mi. N, 4 mi. W Bonner Springs, 2 (KU). *Linn Co.:* ½ mi. N, 4 mi. W Prescott, 1 (KU). *Lyon Co.:* Emporia, 1 (UMMZ). *Marion Co.:* 1 mi. N, ½ mi. E Lincolnville, 1 (KU). *Marshall Co.:* Lake Idlewild, 1½ mi. N, ½ mi. E Waterville, 1 (KU); 2 mi. N, ½ mi. E Oketo, 5 (MHP); 1½ mi. N, ½ mi. W Oketo, 1 (MHP); 1½ mi. N Oketo, 2 (MHP); 1 mi. N Oketo, 3 (MHP); 1 mi. W Oketo, 1 (MHP); 1 mi. N Waterville, 1 (KU); ½ mi. NW Waterville, 3 (KU); 1 mi. E Waterville, 4 (KU); ½ mi. SW Waterville, 2 (KU). *McPherson Co.:* ½ mi. S, ½ mi. W Lindsborg, 1 (KU); 1 mi. S, ½ mi. W Lindsborg, 2 (KU). *Miami Co.:* 11 mi. SSE Paola, 2 (KU). *Montgomery Co.:* Coffeyville, 1 (OU); Independence, 1 (KU). *Morris Co.:* 4⅛ mi. S, 5½ mi. W Council Grove, 1 (KU). *Nemaha Co.:* 6 mi. N Sabetha, 1 (KU); 2½ mi. S Sabetha, 2 (KU); 3½ mi. S, ¾ mi. E Sabetha, 3 (KU). *Norton Co.:* 1 mi. SW Norton, 1 (KU). *Osage Co.:* 1¾ mi. S, 1$^{7}/_{10}$ mi. E Berryton, 1 (KU); 8 mi. N, 9 mi. E Osage City, 10 (MHP). *Osborne Co.:* 2½ mi. S, 6 mi. E Covert, 1 (MHP). *Phillips Co.:* 1 mi. S, 1 mi. W Agra, 1 (MHP); ¾ mi. S, ¼ mi. W Kirwin, 1 (MHP); 1 mi. S Kirwin, 1 (MHP); Catfish Cove, 3¾ mi. S, 3 mi. W Kirwin, 2 (MHP); 4½ mi. S, 3¼ mi. W Kirwin, 1 (MHP); 5 mi. S, 4 mi. W Kirwin, 1 (MHP). *Pottawatomie Co.:* Manhattan, 2 (USNM);

Onaga, 2 (USNM); 5 mi. N Westmoreland, 2 (MHP). *Pratt Co.:* 4 mi. N, ¼ mi. E Pratt, 1 (KU). *Rawlins Co.:* Atwood Lake, Atwood, 3 (KU); 2 mi. S Ludell, 1 (KU). *Republic Co.:* Rydal, 1 (KU). *Rice Co.:* 5 mi. W Sterling, 1 (MHP). *Riley Co.:* Fort Riley, 1 (USNM); Manhattan, 15 (13 AMNH, 1 KU, 1 UMMZ); 1 mi. E Manhattan, 2 (UCONN); 6 mi. E Manhattan, 1 (UCONN). *Rooks Co.:* 3 mi. S, 3 mi. W Stockton, 5 (MHP). *Rush Co.:* 1/16 mi. E LaCrosse, 2 (MHP). *Russell Co.:* 5 mi. N, 1 mi. E Dorrance (T.13S, R.11W, NE ¼ Sec. 17), 2 (MHP); 4 mi. N, 4 mi. E Dorrance (T.13S, R.11W, SW ¼ Sec. 23), 2 (MHP); 3 mi. N, 4 mi. E Dorrance (T.13S, R.11W, NE ¼ Sec. 26), 3 (MHP); 6½ mi. S, ½ mi. E Lucas (T.12S, R.11W, NE ¼ Sec. 34), 1 (MHP); 8½ mi. S, ½ mi. E Lucas (T.13S, R.11W, NE ¼ Sec. 10), 1 (MHP). *Shawnee Co.:* 1 mi. N, 3 mi. W Auburn, 5 (KU); 4½ mi. N, 3 mi. W Topeka, 1 (KU); 1.6 mi. N, 3 mi. W Wakarusa, 1 (KU). *Sheridan Co.:* 13 mi. E Hoxie, 4 (MHP); Saline River, 15 mi. S, 15 mi. E Hoxie, 17 (KU). *Smith Co.:* ½ mi. N, 1 mi. E Smith Center, 1 (MHP); 2 mi. E Smith Center, 2 (KU). *Stafford Co.:* 5½ mi. N, 8 mi. E Hudson (T.21S, R.11W, NW ¼ Sec. 34), 1 (MHP); 1 mi. S, 4 mi. E Hudson, 1 (MHP). *Sumner Co.:* ¼ mi. S, 3 mi. E Oxford, 1 (KU). *Trego Co.:* ½ mi. N, 3¼ mi. W Ellis (*in* Ellis Co.), 2 (MHP); ½ mi. N, 3 mi. W Ellis (*in* Ellis Co.), 3 (MHP); 2½ mi. W Ellis (*in* Ellis Co.), 1 (MHP); 14½ mi. S, 5½ mi. E Ogallah, 1 (MPH). *Woodson Co.:* Neosho Falls, 3 (2 KU, 1 USNM); 2½ mi. N Toronto, 1 (KU); 2 mi. S Toronto, 1 (KU).

LOUISIANA. *Caddo Par.:* 5 mi. NE Greenwood, 2 (LSU); 3.75 mi. N, 0.75 mi. W Greenwood, 15 (LSU).

MISSOURI. *Camden Co.:* Hahatonka, 2 (UMMZ). *Cape Girardeau Co.:* Cape Girardeau, 3 (MOU). *Douglas Co.:* T.27N, R.13W, Sec. 1, 1 (MOU). *Franklin Co.:* Meramec State Park, 2 (MOU); Washington, 1 (MOU). *Greene Co.:* Springfield, 4 (MOU). *Jefferson Co.:* Kimmswick, 1 (USNM). *Morgan Co.:* Gravois Mills, 1 (MOU). *St. Clair Co.:* no particular locality, 1 (MOU). *Ste. Genevieve Co.:* Sprott, 1 (MOU). *Wright Co.:* Mountain Grove, 1 (MOU).

OKLAHOMA. *Atoka Co.:* 20 mi. SW Atoka, 2 (OU). *Cleveland Co.:* Norman, 7 (6 KU, 1 OU); 2 mi. S, 1 mi. W Norman, 1 (OSU); 4 mi. S Norman, 1 (OU); 5 mi. S Norman, 1 (OU). *Comanche Co.:* Camp Bolder, Wichita Mts. Refuge, 1 (OSU). *Creek Co.:* Sapulpa, 3 (KU). *Garvin Co.:* 3 mi. N, 2 mi. W (by road) Davis (*in* Murray Co.) on I-35, 1 (MHP). *Kay Co.:* mouth Salt Fork River, 1 (OSU). *Logan Co.:* T.16N, R.4W, Sec. 11, 1 (OU). *McClain Co.:* 8 mi. W Norman (*in* Cleveland Co.), 2 (PSK). *Murray Co.:* 1.3 mi. S, 2.2 mi. W (by road) Davis, 4 (MHP); 5.7 mi. S, 2.3 mi. W (by road) Davis, 1 (MHP); Platt National Park, 5 (KU); Sulphur, near Travertine Creek, 1 (OSU). *Noble Co.:* 1 mi. E Jct. Hwy. 177 and Hwy. 15, 1 (OU). *Osage Co.:* Adams Ranch, 12 mi. N, 5 mi. E Shidler, 40 (MMNH); "3 mi. W Indian Hills Bridge, 3 mi. E Arkansas River Bridge at Ponca," 1 (OSU). *Ottawa Co.:* 1½ mi. S, 1½ mi. W Picher, 1 (OSU). *Payne Co.:* no particular locality, 2 (OSU); T.18N, R.2E, Sec. 2, 1 (OSU); T.19N, R.1E, SE ¼ Sec. 18, 1 (OSU); Boomer Lake, 1 mi. N Stillwater, 1 (OSU); Hwy. 177, 3 mi. N Hwy. 51, 1 (OSU); 1 mi. N Jct. Hwy. 51 and Hwy. 81, 1 (OSU); Lake Carl Blackwell, 9 mi. W Stillwater, 7 (OSU); Lake Carl Blackwell, 7 mi. W Stillwater, 1 (OSU); 6 mi. NE Stillwater, 1 (OSU); 3 mi. N, 5 mi. W Stillwater, 1 (OSU); Hwy. 177, 3 mi. N Hwy. 51 (3 mi. N Stillwater), 1 (OSU); 2 mi. N, ½ mi. E Stillwater, 1 (OSU); 1 mi. N Jct. Hwy. 51 and Hwy. 81, 1 (OSU); ⅛ mi. N, 2¼ mi. W Stillwater, 1 (OSU); 6 mi. W Stillwater, 1 (OSU); 3 mi. W Stillwater, 2 (OSU); Stillwater, 4 (OSU); 2 mi. E Stillwater, 1 (OSU); ½ mi. S, 7 mi. W Stillwater, 1 (OSU); 2 mi. S Stillwater, 1 (OSU); 2 mi. S, ½ mi. E Stillwater, 1 (OSU); 2½ mi. S Stillwater, 3 (OSU); 3 mi. S, 4 mi. W Stillwater, 1 (OSU); 3 mi. S Stillwater, 1 (OSU); 2 mi. W Yale, 1 (OSU). *Pittsburg Co.:* 9 mi. SE Eufaula, 1 (OU). *Pottawatomie Co.:* Tecumseh, 2 (KU). *Rogers Co.:* 7 mi. N Claremore, 1 (OSU). *Tulsa Co.:* Mohawk Park, 3 (UMMZ); 7 mi. S, 4 mi. E Tulsa, 1 (OU); West Rim Sequoyah Lake, 1 (OSU). *Washington Co.:* Bartlesville, 1 (OSU).

Blarina hylophaga plumbea Davis

Blarina brevicauda plumbea Davis, J. Mamm., 22:317, 1941; Hall and Kelson, The mammals of North America, 1:54, 1959; Hall, The mammals of North America, 1:56, 1981.

Blarina carolinensis plumbea Schmidly and Brown, Southwestern Nat., 24:45, 1979.

Holotype.—Female, adult; skin and skull; TCWC 1541, Texas Cooperative Wildlife Collection; from ½ mi. W Marano Mill, Aransas National Wildlife Refuge, Aransas Co., Texas; collected 31 January 1941, by J. O. Stevenson, original number X26.

Diagnosis.—This is an allopatric population, separated from other populations of *Blarina hylophaga* by an area unoccupied by short-tailed shrews, and then by populations of *Blarina carolinensis*.

Comparisons.—*Blarina hylophaga plumbea* is morphologically indistinguishable from southern populations of *B. h. hylophaga*, but is smaller than material from Kansas.

Range.—Known only from Aransas National Wildlife Refuge, Aransas Co., Texas.

Remarks.—In this study, this population is placed consistently with samples of *Blarina hylophaga* rather than with the nearer populations of *B. carolinensis*, corroborating the results of Schmidly and Brown (1979), who found this population significantly different from other populations of *Blarina* in Texas. As this population has never been karyotyped, and as it is isolated from the range of all species of *Blarina*, it should be retained provisionally as a distinct subspecies.

Specimens examined.—TEXAS. *Aransas Co.:* Aransas Wildlife Refuge, 22 mi. S Austwell (*in* Refugio Co.), 7 (TCWC).

ADDITIONAL SPECIMENS EXAMINED

Blarina carolinensis

ALABAMA. *Cullman Co.:* Ardell, 8 (USNM). *Etowah Co.:* Attalla, 1 (USNM). *Hale Co.:* Greensboro, 1 (USNM). *Russell Co.:* Seale, 1 (USNM). *Sumter Co.:* York, 2 (USNM).

ARKANSAS. *Ashley Co.:* T.19S, R.8W, SW ¼ SE ¼ Sec. 14, 1 (UAM); ½ mi. S Crossett on Hwy. 133, 1 (ASUZC); Lucas Pond near Crossett, 1 (UAM); 8 mi. NE Hamburg, 5 (UA). *Bradley Co.:* 10 mi. NW Warren, 1 (TTU); 1 mi. E Warren, 1 (ASUZC). *Clay Co.:* T.19N, R.8E, Sec. 7, 1 (ASUZC); 2 mi. E Boydsville on Hwy. 90, 1 (ASUZC); 3 mi. N Pollard, 1 (ASUZC); 3 mi. N Rector, 1 (ASUZC); ½ mi. S Rector on Hwy. 1, 1 (ASUZC); 2 mi. S Rector on Hwy. 1, 1 (ASUZC); 1 mi. S Reyno, 1 (ASUZC). *Craighead Co.:* no particular locality, 4 (ASUZC); T.12N, R.6W, Sec. 22, 1 (ASUZC); ½ mi. E Airport Road, 2 (ASUZC); Arkansas State University, 2 (ASUZC); S of Arkansas State University, 1 (ASUZC); 2 mi. SE Arkansas State University, 1 (ASUZC); Craighead Lake, 1 (ASUZC); 4 mi. N Jonesboro, 2 (ASUZC); 3 mi. NE Jonesboro, 1 (ASUZC); 3 mi. N Jonesboro, 1 (ASUZC); 2 mi. NE Jonesboro, 1 (ASUZC); 2 mi. N Jonesboro off Hwy. 141, 1 (ASUZC); 1 mi. N Jonesboro, 1 (ASUZC); Jonesboro, 5 (ASUZC); Jonesboro Airport, 5 (ASUZC); Lake City, 3 (USNM); 2 mi.

S Otwell, 1 (ASUZC); S of TV 8 Tower, 15 (ASUZC). *Crittendon Co.:* 1 mi. N Stavy on Hwy. 61, 1 (ASUZC). *Cross Co.:* 3 mi. S Birdeye on Hwy. 163, 4 (ASUZC); Cherry Valley, 33 (ASUZC); Village Creek State Park, 9 (ASUZC). *Drew Co.:* T.12S, R.7W, SW ¼ NE ¼ Sec. 35, 1 (UAM); T.12S, R.7W, Sec. 35, 2 (UAM); T.13S, R.7W, Sec. 2, 2 (UAM); T.13S, R.7W, Sec. 11, 1 (UAM); T.14S, R.6W, NW ¼ Sec. 4, 1 (UAM); Arkansas A&M, 2 (TTU); 2½ mi. S, 1¾ mi. W Monticello, University of Arkansas at Monticello campus, 5 (UAM); "3.3 mi. on Old Hamburg Road," 1 (TTU); Wilson Saw Mill, ¼ mi. E Harman, 1 (TTU). *Garland Co.:* no particular locality, 2 (USNM). *Greene Co.:* no particular locality, 1 (ASUZC); ASU Fishponds, Walcott, 25 (ASUZC); across from Beech Grove Cemetery, on Hwy. 141, 1 (ASUZC); 5 mi. N Paragould on Hwy. 135, 1 (ASUZC); 4.5 mi. N Paragould on Hwy. 135, 1 (ASUZC); 3.5 mi. W Rector, 1 (ASUZC). *Howard Co.:* 1.5 mi. S, 9 mi. W Umpire, 2 (UA). *Independence Co.:* T.12N, R.4W, Sec. 3, 1 (ASUZC); T.12N, R.4W, Sec. 4, 1 (ASUZC); T.13N, R.6W, Sec. 8, 1 (ASUZC). *Jackson Co.:* no particular locality, 1 (ASUZC); ½ mi. N mouth of Village Creek, 1 (ASUZC); Village Creek, SE of Swifton, 1 (ASUZC). *Jefferson Co.:* Pine Bluff, 9 (UWSP); 1.5 mi. NW Whitehall, 1 (UALR). *Lawrence Co.:* 5.4 mi. E Hoxie on Hwy. 63, 2 (ASUZC); 4 mi. W Lawrence, Craighead Co. line on Hwy. 230, 2 (ASUZC); ⅛ mi. E Portia on Hwy. 63, 1 (ASUZC); 1/5 mi. SE Portia on Hwy. 63, 1 (ASUZC). *Lee Co.:* 2.5 mi. N Felton on Hwy. 1, 1 (ASUZC). *Little River Co.:* Millwood State Park, 1 (UALR). *Mississippi Co.:* 3 mi. N, 2 mi. E Dell, 1 (ASUZC); ½ mi. S Manila on Hwy. 18, 1 (ASUZC); 3 mi. W Manila on Hwy. 18, 22 (ASUZC); 3 mi. W Manila on Hwy. 39, 1 (ASUZC); 3 mi. W Manila, 4 (ASUZC). *Pike Co.:* Delight, 1 (USNM). *Poinsett Co.:* T.12N, R.3E, Sec. 36, 1 (ASUZC); ½ mi. S Craighead Co. line on Hwy. 39, 1 (ASUZC); S Craighead Co. on Hwy. 39, 1 (ASUZC); Harrisburg, 2 (ASUZC); 6 mi. N Weiner on Hwy. 39, 1 (ASUZC). *Polk Co.:* Rock Creek, 3½ mi. W Mena, 2 (UA). *Prairie Co.:* 4 mi. E Des Arc, 1 (ASUZC); 8 mi. S Des Arc, 1 (UALR); 1/5 mi. W Little Dixie, 1 (ASUZC). *Pulaski Co.:* 1 mi. N Jacksonville, 2 (UALR); Jacksonville, 2 (UALR); 1 mi. SW Jacksonville, 1 (UALR); 1 mi. S Jacksonville, 1 (UALR); 2 mi. SW Jacksonville, 1 (UALR); 9 mi. N Little Rock, 1 (UA); 10 mi. SW Little Rock, 1 (UALR). *Randolph Co.:* 1 mi. NE Pocahontas, 1 (ASUZC); 1 mi. W Pocahontas, 1 (UA). *Saline Co.:* Col. Glen Rd., 10 mi. W I-430, 1 (UALR). *Union Co.:* Eldorado, 2 (UA). *White Co.:* Beebe, 1 (USNM). *Woodruff Co.:* 4 mi. S Fair Oaks on Hwy. 39, 1 (ASUZC).

GEORGIA. *Dodge Co.:* McRea, 3 (ISU). *Earl Co.:* 5 mi. S Blakeley, 1 (USNM). *Grady Co.:* Beachton, 4 (USNM). *Liberty Co.:* St. Catherine's Island, 2 (AMNH). *Thomas Co.:* Boston, 1 (USNM).

LOUISIANA. *Bienville Par.:* 6 mi. N Mt. Olive, Dugdemono River, 2 (LSU). *Caddo Par.:* 3 mi. S, 2 mi. W Blanchard, 8 (LSU). *Calcasieu Par.:* 7 mi. W Lake Charles, ½ mi. SW Maplewood, 1 (LSU); 2 mi. SW Sulphur, 1 (LSU). *Evangeline Par.:* 4 mi. NNW Ville Platte, Rte. 373, 1 (LSU). *Grant Par.:* 2 mi. SW Montgomery Pond on Wardlow Estate, 1 (LSU). *Lincoln Par.:* Ruston, 2 (LATU); Tech Farm, 1 mi. S Ruston, 10 (LATU). *Sabine Par.:* Bayou Nagreet River, 1 (LSU). *Vernon Par.:* ¾ mi. E Simpson, 1 (LSU). *West Baton Rouge Par.:* 6 mi. W Port Allen, on I-10, 1 (LSU); 7 mi. W Mississippi River on I-10, 1 (LSU). *Winn Par.:* 1 mi. N Winnfield, 1 (LATU).

OKLAHOMA. *McCurtain Co.:* Flat Swamp, 6 mi. SE (by road) Eagletown, 1 (OSU).

MISSISSIPPI. *Adams Co.:* Washington, 8 (USNM). *Harrison Co.:* 3 mi. N Biloxi, 2 (AMNH); Biloxi, 2 (USNM). *Marshall Co.:* Pleasant, 1 (OU); Wall Doxey State Park, 2 (KU). *Scott Co.:* 3.5 mi. E Morton Corp. Limit, 6 (KU). *Tishomingo Co.:* 2 mi. S, 2 mi. E Tishomingo, 2 (KU). *Washington Co.:* 4½ mi. W Hollandale, 1 (KU).

MISSOURI. *Butler Co.:* 3 mi. W (by Hwy. 60) Ash Hill, 1 (MHP); Poplar Bluff, 1 (MOU). *Dunklin Co.:* Kennett, 1 (MOU). *St. Louis Co.:* St. Louis, 2 (USNM). *Stoddard Co.:* Mingo National Wildlife Refuge, 1 (MOU).

SOUTH CAROLINA. *Charleston Co.:* Merrymede, St. Andrew's Parish, 1 (KU); Porcher's Bluff, 3 (ROM). *Georgetown Co.:* Georgetown, 1 (USNM); Plantersville, 2 (USNM).

TENNESSEE. *Decatur Co.:* Perryville, 1 (OU). *Madison Co.:* Jackson, 1 (ROM). *Shelby Co.:* 13 mi. N Memphis, 1 (KU).

TEXAS. *Hardin Co.:* 0.8 mi. N, 2.6 mi. E Saratoga, 12 (TCWC); Saratoga, Lance Rosien Recreational Park, 3 (TCWC); 8 mi. NE Sour Lake, 1 (USNM); 7 mi. NE Sour Lake, 1 (USNM); 1.8 mi. S, 2.9 mi. E Village Mills, 4 (TCWC); 2 mi. S, 3¼ mi. E Village Mills, 1 (TCWC). *Nacogdoches Co.:* 1 mi. E Nacogdoches, 1 (SFASU); Banita Creek, Nacogdoches, 1 (SFASU); La Nana Creek, Nacogdoches, 2 (SFASU); Nacogdoches, 2 (SFASU); 7 mi. SE Nacogdoches, 1 (SFASU); Stephen F. Austin College Farm, 1 (SFASU). *Newton Co.:* 10.5 mi. N Burkeville, 1 (TCWC); 10.4 mi. N Burkeville, 1 (TCWC); 10 mi. N Burkeville, 4 (TCWC); Burkeville, 13 (TCWC). *Polk Co.:* 1.4 mi. N, 2.2 mi. W Dallardsville (30°38′56″N, 94°40′13″W), 3 (TCWC). *San Jacinto Co.:* Shepherd, 1 (TCWC). *Tyler Co.:* 1.7 mi. N, 1.6 mi. W Spurger, 3 (TCWC); 3.1 mi. N, 2.5 mi. W Spurger, 8 (TCWC); Town Bluff Reservoir, 15 mi. E Woodville, 1 (TTU); 4.2 mi. S, 1.6 mi. W Warren, 6 (TCWC); 4.3 mi. S, 1.4 mi. W Warren, 4 (TCWC); 4.3 mi. S, 1.1 mi. W Warren, 1 (TCWC); 4.5 mi. S, 0.5 mi. W Warren, 2 (TCWC); 4.8 mi. S, 0.7 mi. W Warren, 2 (TCWC). *Walker Co.:* Huntsville, 1 (TCWC); 2 mi. E Huntsville, 1 (TCWC).

ACKNOWLEDGMENTS

Partial support for this study was provided by a Theodore Roosevelt Memorial Grant (to SBG), a curatorial-research internship from the Department of Mammalogy, American Museum of Natural History (to SBG), and two research grants from the National Science Foundation (DEB 77-12283 to HHG and DEB 77-13120 to JRC). Special thanks are due Dr. and Mrs. Sydney Anderson, who generously provided accommodations while George was working in New York City. Thanks also are due the following curators, who permitted examination of specimens in their care (abbreviations in parentheses are used to identify material in the lists of Specimens Examined): S. Anderson, American Museum of Natural History (AMNH); V. R. McDaniel, Arkansas State University (ASUZC); J. O. Whitaker, Jr., Indiana State Vertebrate Collections, Indiana State University (ISU); R. S. Hoffmann, Museum of Natural History, University of Kansas (KU); J. W. Goertz, Louisiana Tech University (LATU); M. S. Hafner, Louisiana State University (LSU); E. C. Birney, Bell Museum of Natural History, University of Minnesota (MMNH); W. H. Elder, University of Missouri (MOU); B. P. Glass, Museum of Natural and Cultural History, Oklahoma State University (OSU); J. K. Greer, Stovall Museum of Science and History, University of Oklahoma (OU); H. A. Hays, Pittsburg State University, Kansas (PSK); R. L. Peterson, Royal Ontario Museum (ROM); C. Fisher, Stephen F. Austin State University (SFASU); D. J. Schmidly, Texas Cooperative Wildlife Collection, Texas A&M University (TCWC); R. J. Baker, The Museum, Texas Tech University (TTU); G. Heidt, University of Arkansas at Little Rock (UALR); R. W. Wiley, University of Arkansas at Monticello (UAM); J. A. Sealander, University of Arkansas (UAZ); R. A. Wetzel, University of Connecticut (UCONN); E. T. Hooper, Museum of Zoology, University of Michigan (UMMZ); M. A. Bogan, National Fish and Wildlife Laboratory (USNM); C. A. Long, Museum of Natural History, University of Wisconsin at Stevens Point (UWSP). Specimens in the Carnegie Museum of Natural History and the Museum of the High Plains, Fort Hays State University, are designated by the abbreviations CM and MHP, respectively. Other persons to whom thanks are due include C. A. Jones, M. P. Moulton, and M. A. Ports for their assistance in the field; E. D. Fleharty, G. K. Hulett, T. L. Yates, and R. J. Zakrzewski for their reviews of this and earlier drafts of this manuscript; D. Eining and G. Ford for their expert and patient help with the computer; B. Lange for typing early drafts. Parts of this report were submitted by George to the Department of Biological Sciences, Fort Hays State University, in partial fulfillment of the requirements for the degree of Master of Science.

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